



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER OF PATENTS AND TRADEMARKS
Washington, D.C. 20231
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/484,421	01/18/2000	Martin Dubs	622/48561	9681

7590 04/18/2002

CROWELL & MORING LLP
INTELLECTUAL PROPERTY GROUP
P.O. BOX 14300
WASHINGTON, DC 20044-4300

EXAMINER

CANTELMO, GREGG

ART UNIT	PAPER NUMBER
----------	--------------

1753

DATE MAILED: 04/18/2002

18

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No. 09/484,421	Applicant(s) DUBS ET AL.	
	Examiner Gregg Cantelmo	Art Unit 1753	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 28 March 2002.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 35-59 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 35-59 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 18 January 2000 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892) 4) ☐ Interview Summary (PTO-413) Paper No(s). _____
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948) 5) ☐ Notice of Informal Patent Application (PTO-152)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 14. 6) ☐ Other: _____

DETAILED ACTION

Response to Amendment

1. in response to the amendment received March 28, 2002:
 - a. Claims 1-16 have been cancelled. Claims 17-59 are pending with claims 17-34 withdrawn from consideration due to a prior restriction requirement;
 - b. The drawing objection of paragraph 7 in the Office Action mailed June 14, 2001, stands.
 - c. The prior art rejections are withdrawn in light of the newly provided claims. The addition of limitations to the new independent claims such as the toroidal magnetic field represent new limitations permitting finality of this office action.

Election/Restrictions

2. This application contains claims 17-34 drawn to an invention nonelected with traverse in Paper No. 7. A complete reply to the final rejection must include cancellation of nonelected claims or other appropriate action (37 CFR 1.144) See MPEP § 821.01.

Information Disclosure Statement

3. The information disclosure statement filed January 28, 2002 has been placed in the application file and the information referred to therein has been considered as to the merits.

Drawings

4. The drawings are objected to under 37 CFR 1.84(h)(5) because Figures. 2a 2b show(s) modified forms of construction in the same view. Correction is required.

The solid lines depict a first embodiment of the substrate carrier and/or substrates. The dash lines appear to represent the same relationship but for a second embodiment having larger diameter substrates and/or substrate carrier. The relationship for defining the substrate diameter for a single substrate can likely be shown using one substrate size to show indication of the diameter as disclosed by applicant (Fig. 2a). Likewise this applies to Fig 2b wherein the diameter of note can be defined for one form of the carrier having multiple substrates.

Response to Arguments

5. Applicant's arguments filed September 14, 2001 have been fully considered but they are not persuasive. The drawings are unclear as provided. A cleaner and more accurate drawing may render the drawing acceptable, but note that the seemingly hand-drawn lines are not clear and consistent. If applicant prefers to have the drawing remain as is, the Examiner requests a clearer drawing for consideration of the relationships set forth therein.

Specification

6. The substitute specification filed March 28, 2002 has been entered.

Claim Objections

7. Claims 49, 50 and 58-59 are objected to because of the following informalities:
- a. The term "approx." as recited in line 2 of claims 49 and 50 should not be abbreviated;
 - b. The term "consider" in claim 58 at line 9 of the claim should be -- considered--;

Appropriate correction is required.

Claim Rejections - 35 USC § 112

8. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

9. Claims 35-57 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

The claim recites that the toroidal magnetic field is *around* said first axis with symmetric field polarity considered in a cutting plane through said new sputter surface *and* containing said first axis. The language here appears to be contradictory since the magnetic field is disclosed as both around the first axis and containing the first axis. If the field were around the first axis, it would not appear to contain it since the field is separate from the axis. See Figs. 1 and 4 which show a toroidal magnetic field that is around the target axis and which does not contain the axis. Applicant is advised to use

Art Unit: 1753

language similar to that of claim 58 which more clearly recites that the sputter source contains said normal axis.

Claim Rejections - 35 USC § 102

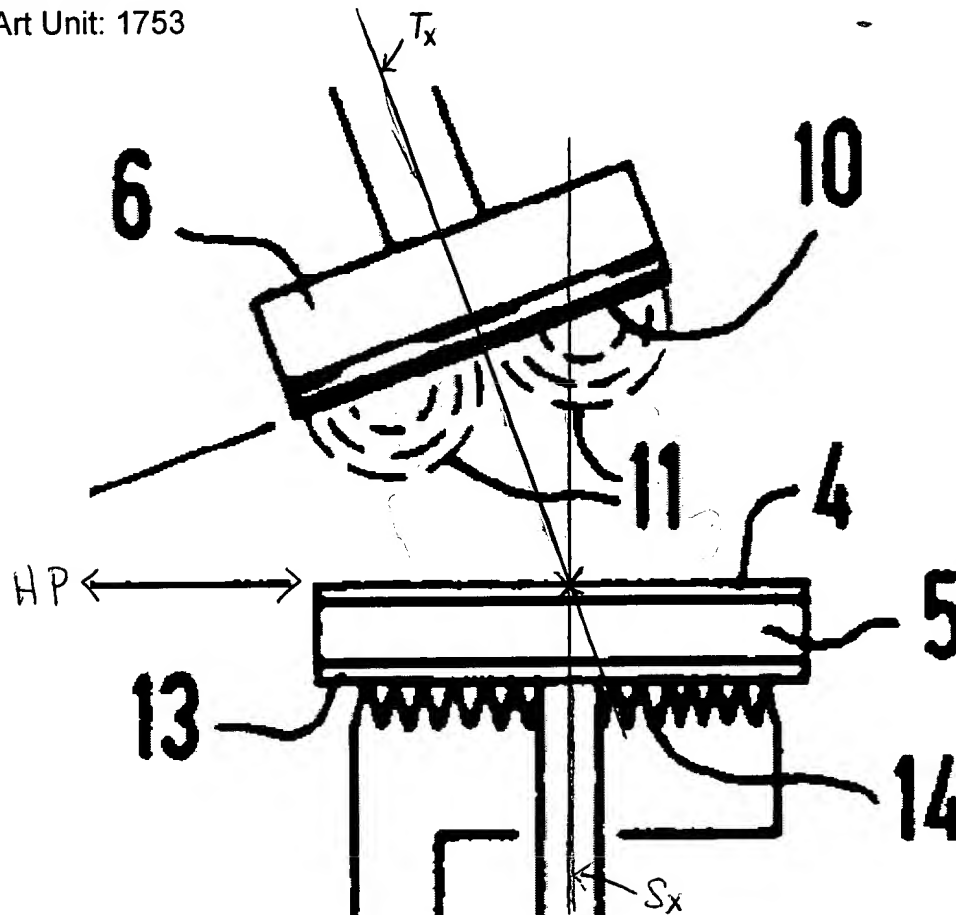
10. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

11. Claims 35, 37, 42, 43 and 57-58 are rejected under 35 U.S.C. 102(b) as being clearly anticipated by DE 41 04 592 A1 (DE '592).

Fig. 1 discloses a sputtering chamber 3 comprising at least one sputtering source 6 with a new sputter surface 10 at least approximately symmetrical with respect to a first axis (Tx) (see drawing below for details), the axis being perpendicular to the sputter surface 10, substrate carrier 3 which is arranged to be driveably rotatable about a second axis (Sx), wherein the first and second axes are oblique with respect to one another and said sputtering source is a magnetron sputtering source with at least one toroidal magnetic field 11 around said first axis with symmetric field polarity considered in a cutting plane through said new sputter surface and containing said first axis (as applied to claim 35).



The first and second axes are virtual and infinite along the plane which defines each respective axis. Since the axes are oblique, they will intersect at some point (red X in marked up Fig. 1 above as applied to claim 37).

The first and second axes have a smallest mutual spacing situated on a surface of workpiece 18 (as applied to claim 42).

The substrate carrier 13 is located within chamber 3 at least approximately horizontally (HP in marked up Fig. 1 above as applied to claim 43).

The substrate carrier surface and new sputter surface bound a process space as shown in Fig. 1 (yellow highlight as applied to claim 57).

With respect to the method: DE '592 discloses: introducing a workpiece 4 into a sputtering chamber 3, rotating the workpiece about a rotational axis, providing a

Art Unit: 1753

sputtering source 6 with a sputtering surface 10 having a central axis oblique with respect to the rotational axis, sputter coating a workpiece by a source thereby providing at least one toroidal magnetic field 11 with a symmetric field-polarity considered in a cutting plane through said sputtering source which contains said normal axis (as applied to claim 58.

Claim Rejections - 35 USC § 103

12. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

13. Claims 36, 51-55 and 58 are rejected under 35 U.S.C. 103(a) as being unpatentable over DE '592 in view of U.S. patent No. 6,037,313 (Nagaishi) or 5,439,877 (Face).

The teachings of DE '592 have been discussed above and are incorporated herein.

The differences not yet discussed are: using a disk shaped target (symmetrical target source of claims 36 and 51); where in the ratio of the diameter of the substrate to the diameter of the target is in a range from 0.5 to 2.4 (claim 51) and further in a range from 1 to 2.4 (claim 52), wherein the substrate has a diameter ranging from 50mm to 400mm (claim 53), further from 50mm to 300mm (claim 54) and even further to

Art Unit: 1753

particular diameters from the group of 64mm, 120mm, 160mm and 240 mm (claim 55); or of the substrate explicitly being a wafer (claim 58).

It is known to form superconductive films on circular substrates from circular targets (both being symmetrical). Nagaishi is drawn to depositing superconductive films such as Y-Ba-Cu-O. A single crystalline Si wafer having a size of 76 mm in diameter and 0.4 mm in thickness was used for substrate 6. A Y-Ba₂Cu₃O_{7-x} disc having a size of 76 mm in diameter and 5 mm in thickness was used for target 5 (col. 12, ll. 49-55).

Selection of the shape is a matter of preference for the intended use of the finished product. Selection of the shape of the target then being a matter of choice.

The motivation for selecting the shapes of the target, substrate and substrate carrier to be rotationally symmetrical

Face also teaches that using 76 mm targets and substrates in sputtering systems for forming superconductive films represent conventional sizes for both components and readily available for use in sputtering systems (col. 8, ll. 5-16).

The target is a disk and therefore symmetrical (as applied to claims 36 and 51). The substrate and target are of the same diameter and have a ratio of 1 (as applied to claims 51 and 52). The substrate diameter is 76 mm, which is within the ranges specified in claims 53 and 54. Furthermore the particulars of the substrate in the context of the claims do not further limit the configuration of the apparatus itself. The claims reciting the diameter ranges (claims 53-55) only recite diameter ranges and do not recite how the diameters further limit the configuration of the apparatus.

14. Claims 44 is rejected under 35 U.S.C. 103(a) as being unpatentable over DE '592 in view of JP 2 141568 (JP '568).

The teachings of DE '592 have been discussed above and are incorporated herein.

The difference not yet discussed is a projection of said new sputter surface onto a plane perpendicular to said first axis is larger than a projection surface of the substrate to be sputter coated onto said plane.

JP '568 is drawn to off-axis sputtering of superconductive films (abstract and Fig.1). By configuring the substrate and target wherein the projection of the sputter surface in a plane perpendicular to the first axis is larger than a projection surface of the substrate to be sputter coated onto said plane prevents resputtering of the thin film from occurring (abstract).

The motivation for providing a projection of said new sputter surface onto a plane perpendicular to said first axis is larger than a projection surface of the substrate to be sputter coated onto said plane in an oblique sputtering system is to prevent resputtering of the thin film during deposition.

Therefore it would have been obvious to one of ordinary skill in the art at the time the claimed invention was made to modify the teachings of DE '592 by providing a projection of said new sputter surface onto a plane perpendicular to said first axis is larger than a projection surface of the substrate to be sputter coated onto said plane in an oblique sputtering system as shown by JP '568 since it would have prevented resputtering of the thin film during deposition.

15. Claims 56 is rejected under 35 U.S.C. 103(a) as being unpatentable over DE '592 in view of either Tateshi or Moslehi.

The teachings of DE '592 have been discussed above and are incorporated herein.

The difference not yet discussed is of moving the substrate linearly in a direction parallel to the substrate carrier axis (claim 56).

Tateshi discloses a magnetron sputtering apparatus wherein the substrate support moves laterally. The lateral movement means allows for positioning a substrate such that it can be transferred to and from the processing chamber while also providing close target to substrate processing during deposition (see Fig. 7). It is well known in the art to position a gate for introducing the substrate to the processing chamber, near the bottom of the chamber and thereafter raise the substrate and substrate platen to an upper position closer to the target.

Additionally use of an actuator to move the substrate in a vertical position to achieve a predetermined deposition distance between the substrate and the tantalum target in order to establish the optimal deposition uniformity and material properties (Moslehi, col. 11 lines 29-35).

The motivation for providing means for moving the substrate carrier in this fashion is to raise the substrate from a substrate chamber insertion position to a wafer film deposition position. It is also known that providing means to move the substrate vertically relative to the deposition source to establish optimal deposition uniformity and material properties.

Therefore it would have been obvious to one of ordinary skill in the art at the time the claimed invention was made to modify the teachings of DE '592 by moving the substrate carrier in this fashion since it would provided means for a wafer inserted at the base of the chamber sidewall to be moved in close proximity to the target and further such movement would have optimized deposition uniformity and material properties of the thin film.

16. Claims 56 is rejected under 35 U.S.C. 103(a) as being unpatentable over DE '592 in view of Yamanishi.

The teachings of DE '592 have been discussed above and are incorporated herein.

The difference not yet discussed is of setting the angle of the magnetron relative to the substrate carrier surface to be within the ranges set forth in claims 38-41.

DE '592 does teach of positioning the magnetron at an angle to the substrate carrier surface (Fig. 1). The angle can be set to a value within the range from 0° to 90° (see col. 3, ll. 1-5).

The preferred angle of the invention of Yamanishi is between 30° and 60° (col. 3, ll. 21-25) to provide uniform thickness of the film on the substrate (col. 8, ll. 25-28 as applied to claims 38-41). And by one example the actual angle is 45° (col. 7, ll. 17-24). Thus it would have been expected that the same range be applied in the prior art, which shows identical positional relationship.

The motivation for positioning the magnetrons relative to the substrate within the range of 30° to 60° is to provide uniform thickness of the film on the substrate.

Therefore it would have been obvious to one of ordinary skill in the art at the time the claimed invention was made to modify the teachings of the DE '592 by positioning the magnetrons at an angle from 30° to 60° relative to the substrate carrier since it would have provided uniform thickness of the film on the substrate.

Claim Rejections - 35 USC § 103

17. Claims 35-38, 42-44, 46-50 and 56-58 are rejected under 35 U.S.C. 103(a) as being unpatentable over JP 2 141 568 A (JP '568) in view of Yamanishi.

Fig. 1 discloses a sputtering system comprising an inherent sputtering chamber, at least one sputtering source 1 with a new sputter surface at least approximately symmetrical with respect to a first axis (Tx in marked-up drawing below), the axis being perpendicular to the sputter surface, substrate carrier 4 which is arranged about a second axis (Ts in the marked-up drawing below), wherein the first and second axes are oblique with respect to one another and said sputtering source is a magnetron sputtering source with at least one toroidal magnetic field. The field lines drawn in the marked up drawing below by Examiner on the basis that such field lines are inherent due to the configuration of the permanent magnet polarities and evident from the erosion profile 3 in the target surface. The magnetic field lines around said first axis with symmetric field polarity considered in a cutting plane through said new sputter surface and containing said first axis (as applied to claim 35).

The target is rotationally symmetrical about its axis (as applied to claim 36).

Art Unit: 1753

When angled as taught by JP '568, the first and second axes, being oblique and infinite will intersect at least approximately (red X in the marked-up drawing as applied to claim 37).

The angle minimum is 60° (abstract as applied to claim 38).

The first and second axes have a smallest mutual spacing D (see marked up drawing below) situated at least approximately on a surface which is to be sputter coated of a substrate (see marked up figure as applied to claim 42).

As shown in Fig.1 rotation of the substrate holder is horizontal with respect to the bottom support surface for the rotating substrate holder (HP plane in drawing as applied to claim 43).

A projection of said new sputter surface onto a plane perpendicular to said first axis (denoted as TPS in the marked up diagram) is larger than a projection surface of the substrate (SPS) to be coated onto said plane (as applied to claim 44).

There is a circular erosion ditch 3 caused by the toroidal magnetic field generated by the permanent magnet relationship shown in Fig. 1, the radius (r_{Tr}) is about $1/3$ of the length D and is within the range of $1/4 \leq r_{Tr} \leq 2/3$ (as shown in the marked up drawing and applied to claim 46).

The target is substantially rotationally symmetrical about its central axis and has an inherent diameter (ϕT). The diameter of the target and length D are about the same (as applied to claim 47).

The substrate has a diameter (ϕ_s) and is much smaller than the length D. Therefore with a substrate diameter less than length D, the ratio of (ϕ_s)/D will be less than 1 (and less than 1.8 as applied to claim 49).

The locus of the smallest mutual spacing is on a plane defined by a surface of the substrate to be coated (see L in marked up figure as applied to claim 50).

The substrate carrier is linearly drivingly displaceable in a direction of the second axis (Fig .1 as applied to claim 56).

The target and substrate face each other and bound a process space on the two sides thereof (yellow highlight Fig. 1 as applied to claim 57).

With respect to the method: JP '568 discloses: introducing a workpiece 5 into a sputtering chamber, providing a sputtering source 1 with a sputtering surface having a central axis oblique with respect to the rotational axis, sputter coating a workpiece by a source thereby providing at least one toroidal magnetic field (inherent from the configuration of the magnet polarities and evident from the configuration of the erosion profile 3 with a symmetric field-polarity considered in a cutting plane through said sputtering source which contains said normal axis (as applied to claim 58).

Art Unit: 1753

Yamanishi employs a rotating substrate holder (see Fig. 2, rotational means 90 and Fig. 7, substrate carrier 17 rotated about its central axis). When employing magnetron sources inclined at an angle relative to the substrate, if the substrate and substrate carrier is made to revolve, the thickness uniformity and quality uniformity of the film formed on the substrate are further improved (col. 7, ll. 20-24 as applied to claims 35 and 58).

The motivation for rotating the substrate about its axis is that the thickness uniformity and quality uniformity of the film formed on the substrate are further improved

Therefore it would have been obvious to one of ordinary skill in the art at the time the claimed invention was made to modify the teachings of JP '568 by rotating the substrate carrier and substrate about the carrier axis as taught in the invention of Yamanishi since it would have further improved the uniformity and quality uniformity of the film formed on the substrate.

With respect to the diameter of the target being approx. $1.2 D$ (claim 48):

JP '568 teaches that the substrate holder 4 can be moved towards and away from the target. As the sputtering target 1 erodes, local erosions spots form in regions 3. This causes a variance in the sputtering flux from the target onto the substrate. To compensate for this variance, JP '568 moves the substrate along the central axis of the substrate carrier. Doing so varies the distance D (locus of smallest mutual spacing). Upon moving the substrate carrier closer to the target to improve deposition uniformity, distance D will increase, thereby increasing the ratio of the target diameter relative to

Art Unit: 1753

the distance D. Given that the ratio from the figures teaches of an approximate 1:1 ratio, decreasing the distance D to improve uniformity of the coating on the substrate, will increase the ratio, rendering the approximate ratio of claim 48 a resulting relationship relative to the change in distance D for improving the substrate coating.

The motivation for decreasing the distance D between the target and substrate is to enhance the deposition profile. By doing so, the ratio of the target diameter (a static value) relative to the distance D will increase from about 1 and render an approximate value of 1.2 an obvious result.

Therefore it would have been obvious to one of ordinary skill in the art at the time the claimed invention was made to modify the teachings of EP '568 by decreasing the distance D since it would have compensated for the variance in sputtering from the local erosions formed on the target. This would have resulted in an increase in the ratio of the target diameter relative to the distance D. Optimizing this distance would have rendered an approximate value of 1.2 an obvious result.

Claim Rejections - 35 USC § 103

18. Claims 35, 37-43, 45 and 57-58 are rejected under 35 U.S.C. 103(a) as being unpatentable over the prior art of U.S. patent No. 5,626,727 (Yamanishi) in view of the description of the invention of Yamanishi.

Fig. 12 shows a prior art configuration which read on the following claims: a sputtering chamber (not shown in Fig. 12 but inherent to a sputtering system, see Figs. 7 and 11 which show placement of sputtering equipment in a sputtering chamber

Art Unit: 1753

comprising at least one sputtering surface symmetrical with respect to a central axis (central axis Tx as marked up below) the axis perpendicular on said new sputtering surface, a substrate carrier (carrying substrate 18) having a second axis (Sx as marked up below) the two axes are oblique with respect to one another, and said sputtering source is a magnetron sputtering source wherein the magnet polarities are arranged such that they will generate a toroidal magnetic field around the first axis with symmetric field polarity considered in a cutting plane through the new sputter surface and containing said first axis. The field lines have been drawn in by the Examiner (dotted lines) given the location of each pole in the target, a toroidal field will result (see also col. 1, ll. 58-60 as applied to claim 35).

The first and second axes are virtual and infinite along the plane which defines each respective axis. Since the axes are oblique, they will intersect at some point (see red X in marked up Fig. 12 below as applied to claim 37).

The first and second axes have a smallest mutual D spacing situated on a surface of workpiece 18 (as applied to claim 42).

The substrate carrier is located approximately horizontally in the chamber (HP), note though that the reference for the horizontal plane is undefined by the claim and can be horizontal relative to any plane in the chamber (see Figs. 2, 7, and 11 all which show the substrate carrier horizontal relative to a chamber wall (or top or bottom as applied to claim 43).

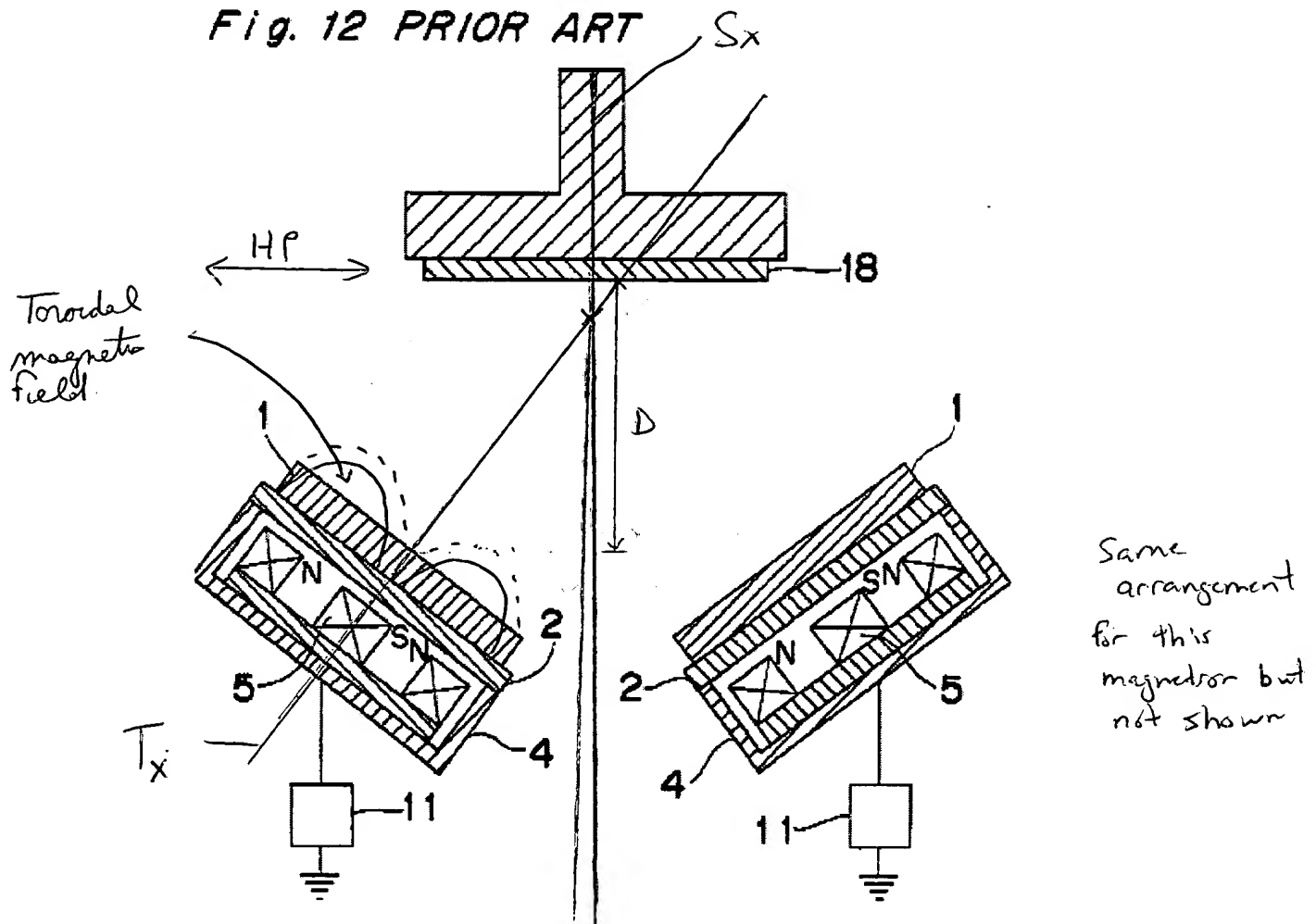
Two sputtering surfaces 1 having individual power sources 11 are provided in the system shown in Fig. 12 (as applied to claim 45).

Art Unit: 1753

The surface of the substrate 18 and its carrier and the surface of the sputter surfaces 1 bound a process space on two sides (yellow highlight Fig. 12 as applied to claim 57).

The prior art employs a method for coating workpiece 18 comprising: introducing workpiece 18 into the sputtering chamber, providing a sputtering source 1 with a sputtering surface and having a central axis which is oblique with respect to the axis of the substrate carrier, sputter coating the workpiece by the source where the source has a toroidal magnetic field with a symmetric field-polarity considered in a cutting plane through said sputter source which contains the normal axis (the toroidal magnetic field lines inherent to the magnetrons in Fig. 12 given the polarities of the electromagnets shown in the magnetrons as applied to claim 58).

Fig. 12 PRIOR ART



Se 4/13/02

The differences between the instant claims and the prior art of Yamanishi are that the prior art of Yamanishi does not explicitly disclose rotating the substrate about its axis (claims 35 and 58) or explicitly of the range of angles within which the magnetrons are positioned relative to the substrate carrier (claims 38-41).

With respect to rotating the substrate about its axis (claims 35 and 58):

The prior art of Yamanishi does not explicitly teach of rotating the substrate carrier and substrate about the carrier axis. The invention of Yamanishi does employ

Art Unit: 1753

such means (see Fig. 2, rotational means 90 and Fig. 7, substrate carrier 17 rotated about its central axis). When employing magnetron sources inclined at an angle relative to the substrate, if the substrate and substrate carrier is made to revolve, the thickness uniformity and quality uniformity of the film formed on the substrate are further improved (col. 7, ll. 20-24 as applied to claims 35 and 58).

The motivation for rotating the substrate about its axis is that the thickness uniformity and quality uniformity of the film formed on the substrate are further improved

Therefore it would have been obvious to one of ordinary skill in the art at the time the claimed invention was made to modify the teachings of the prior art of Yamanishi by rotating the substrate carrier and substrate about the carrier axis as taught in the invention of Yamanishi since it would have further improved the uniformity and quality uniformity of the film formed on the substrate.

With respect to claims 38-41 and the angular relationships set forth therein:

The magnetrons are shown to be at an angle relative to the substrate carrier and although the prior art disclosure of Yamanishi does not explicitly disclose of the range, from a comparison of the position of the magnetrons relative to the substrate as shown in Fig. 12 to that of (Figs. 2 and 7) it would appear that the range of angles for positioning the magnetron sources would have been identical. The preferred angle of the invention of Yamanishi is between 30° and 60° (col. 3, ll. 21-25) to provide uniform thickness of the film on the substrate (col. 8, ll. 25-28 as applied to claims 38-41). And by one example the actual angle is 45° (col. 7, ll. 17-24). Thus it would have been

expected that the same range be applied in the prior art, which shows identical positional relationship.

In the unlikely event that Applicant would argue the inherency of the prior art of Yamanishi showing the claimed ranges, such would have clearly been obvious given the teachings of the invention of Yamanishi as discussed above.

The motivation for positioning the magnetrons relative to the substrate within the range of 30° to 60° is to provide uniform thickness of the film on the substrate.

Therefore it would have been obvious to one of ordinary skill in the art at the time the claimed invention was made to modify the teachings of the prior art of Yamanishi by positioning the magnetrons at an angle from 30° to 60° relative to the substrate carrier since it would have provided uniform thickness of the film on the substrate.

Response to Arguments

19. Applicant's arguments with respect to claims 35-59 are have been considered but are moot in view of the new ground(s) of rejection.

The prior art of record applied as primary references in each of the rejections of this office action show the claimed invention as described above.

Conclusion

20. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

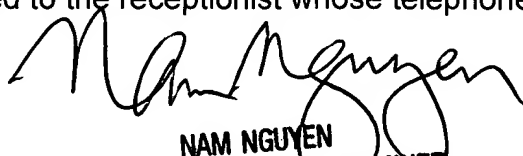
21. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Gregg Cantelmo whose telephone number is (703) 305-0635. The examiner can normally be reached on Monday through Thursday from 8:00 a.m. to 5:30 p.m.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nam Nguyen, can be reached on (703) 308-3322.

FAX communications should be sent to the appropriate FAX number: (703) 872-9311 for After Final Responses only; (703) 872-9310 for all other responses. FAXES received after 4 p.m. will not be processed until the following business day.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0661.

gc


NAM NGUYEN
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 1700

April 12, 2002